

# IMF Working Paper

---

## Implementation of Monetary Policy and the Central Bank's Balance Sheet

*Andrea Schaechter*



## **IMF Working Paper**

Monetary and Exchange Affairs Department

### **Implementation of Monetary Policy and the Central Bank's Balance Sheet <sup>1</sup>**

Prepared by Andrea Schaechter

Authorized for distribution by Piero Ugolini

October 2001

#### **Abstract**

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

This paper discusses how the choice of central banks' operating targets influences the use of their monetary policy instruments and how the latter affect the central bank's balance sheet. This is of particular interest, since the monetary conditionality in IMF-supported programs has traditionally been linked to central bank balance sheet items. Quantity targeting tends to be practiced today mostly in countries in which money markets are not yet well-developed or a monetary aggregate is used as the intermediate target. Most other central banks prefer to target a short-term interest rate, which results in day-to-day changes in balance sheet items becoming endogenous.

JEL Classification Numbers: E51, E52, E58

Keywords: monetary policy, conditionality

Author's E-Mail Address: [aschaechter@imf.org](mailto:aschaechter@imf.org)

---

<sup>1</sup> This paper has benefited greatly from comments by Agnes Belaisch, Mariano Cortes, George Iden, Timothy Lane, Bernard Laurens, Lorenzo Perez, Robert Price, Christine Sampic, Mark Stone, Mark Swinburne, Piero Ugolini, Mark Zelmer, and participants of an internal IMF seminar (May 24, 2001).

Contents	Page
I. Introduction .....	3
II. The Choice of the Operating Target.....	3
A. The Role of Operating Targets.....	3
B. Price versus Quantity Variables as Operating Targets.....	4
C. The Role of the Monetary Policy Strategy for the Choice of the Operating Target .....	6
D. Operating Targets and Policy Instruments.....	8
III. Impact on the Central Bank's Balance Sheet.....	9
IV. The Role of Monetary Conditionality for Monetary Policy .....	14
V. Conclusions.....	18
References.....	26
Text Tables	
1. Central Bank Balance Sheet.....	11
2. Summary Balance Sheet of a Central Bank.....	11
Box	
1. Summary of Balance Sheet Movements under Different Monetary Policy Instruments.....	10
Appendices	
I. Steering Operating Targets Under Uncertainty .....	20
II. Deriving NDA Ceilings in Fund-Supported Programs .....	22
Appendix Tables	
1. Interest Rate versus Base Money as Operating Targets.....	24
2. Preferred Operating Target Under Alternative .....	24
3. Preferred Policy Instruments Under Alternative Operating Targets.....	25

## **I. INTRODUCTION**

The purpose of this paper is to discuss how the choice of central banks' operating targets influences the use of their monetary policy instruments and how the latter affect the central bank's balance sheet. The key variable of monetary policy implementation is the central bank's operating target. This can be a price (short-term interest rate) or a quantity (monetary base) variable. Both operating targets rely on the central bank's ability to manage its balance sheet. The crucial difference is that in case of price targeting, changes in the central bank's balance sheet become endogenous while they are exogenous in the case of quantity targeting. Under price targeting, a central bank accommodates any temporary shifts in the demand or supply of monetary base to avoid that the interest rate moves away from its targeted level. Base money therefore becomes a residual variable; it is endogenous. Under quantity targeting, on the other hand, a central bank does not accommodate shifts in base money demand but tolerates the resulting interest rate fluctuations as long as this is consistent with the quantity target.

This difference is important to point out since the "traditional view" of how a central bank conducts monetary policy has been through steering quantities. Today most central banks of industrial countries, as well as most transition and emerging market central banks, prefer instead to target a short-term interest rate. Quantity targeting is today mostly practiced in countries in which money markets are not yet well-developed or a monetary aggregate is used as the intermediate target. Some of these countries have a Fund-supported program, which defines monetary conditionality for two central bank balance sheet items—a ceiling on the central bank's net domestic assets (NDA) and a floor on its net international reserves (NIR). This paper outlines what role these quantitative performance criteria can play in monetary policy implementation as well as their limitation.

The remainder of the paper is organized as follows. Chapter II provides a brief overview on the role of the operating target for monetary policy implementation. Summary tables are provided in the Appendix. Chapter III describes, instrument-by-instrument, the impact of implementing monetary policy on the central bank's balance sheet. Chapter IV explains the link between traditional IMF monetary conditionality and implementing monetary policy. Chapter V summarizes the findings of the paper.

## **II. THE CHOICE OF THE OPERATING TARGET**

### **A. The Role of Operating Targets**

Operating targets can be tightly controlled by the central bank and represent the first step in the transmission of monetary impulses. As the monopolistic supplier of base money, the central bank can either control its price (short-term interest rate) or its quantity (monetary base or a component of it, for example, bank reserves, net international reserves or net domestic assets). If a central bank had perfect information about market conditions at all times, targeting the price or the quantity would just be two sides of the same coin. Uncertainties and instability in the demand and supply of base money, however, result either in fluctuations in money market

rates, in cases where the central bank targets quantities, or in fluctuations in the monetary base, when it targets a short-term interest rate (see Appendix I).

In addition to short-term interest rates and items of the central bank balance sheet, also the exchange rate can take the role of an operating target, under certain circumstances. This is the case when monetary policy is conducted mostly through central bank interventions in the foreign exchange market rather than through adjustments in the interest rate.<sup>2</sup> Normally, only countries with large stocks of reserves and access to foreign borrowing or restricted capital flows can engage in such operations. In these cases there can be room for a domestic and external dimension of monetary policy.<sup>3</sup>

Operating targets link the intermediate targets (exchange rate or monetary aggregate) or indicator variables of monetary policy, on the one hand, and the central bank's policy instruments, on the other (see graph below) given the lags in the transmission of monetary impulses.<sup>4</sup> What operating target a central bank chooses to steer depends on the central bank's monetary policy strategy (the use of intermediate or indicator variables) and the development of domestic financial markets. Moreover, the choice for the operating target affects the policy instruments (e.g., open market operations, standing facilities, foreign exchange swaps) that a central bank should use. Not all market-based policy instruments are equally well suited for price and quantity targeting.

Instruments → Operating target → Intermediate target or Indicator variables → Ultimate objectives
---

## **B. Price versus Quantity Variables as Operating Targets<sup>5</sup>**

Steering the operating target has two time horizons and objectives. One is adjusting the level of the operating target to change the monetary policy stance with the objective to create

---

<sup>2</sup> In this paper foreign exchange interventions always refer to unsterilized interventions. Sterilized interventions normally have other than monetary policy purposes.

<sup>3</sup> A few countries have in the past used a combined index of a money market rate and the exchange rate as an operating guide, the so-called monetary conditions index (MCI) (Canada and New Zealand; Sweden has used it as an indicator for future demand and inflation). Since the use of an MCI has some caveats, however, it is to-date not used as a formal operating target by any country.

<sup>4</sup> The discussion on the role of instruments, targets, and indicators dates back to the early 1970s. See, for example, Friedman (1975).

<sup>5</sup> For a tabular summary of the pros and cons of price versus quantity operating targets see Appendix Table 1.

monetary conditions that are consistent with the ultimate objectives of monetary policy. The other is day-to-day liquidity management by holding the operating target within a corridor for a certain time period to smooth the peaks and troughs from fluctuations in liquidity demand and supply.

An increasing number of central banks in transition and emerging market countries prefers to target a short-term interest rate, in most cases within an interest rate corridor. Most industrial country central banks have been targeting a short-term interest rate for many years (often since the early 1970s). Efficient and liquid interbank money markets, which includes the existence of a competitive banking system, are preconditions for the use of a short-term money market rate as an operating target. Short-term interest rates are also easy to monitor and well understood by the public. Moreover, signals on changes in the monetary policy can be easily identified. The transmission, however, is not merely through the signaling effect, but at the same time through liquidity or balance sheet effects, since adjusted short-term interest rates provide incentives for banks to adjust their portfolio, including their lending behavior. Stable money market rates also facilitate banks' liquidity management. Two other factors that explain the increasing preference for interest rate over quantity targeting are financial liberalization and technical innovation. Both have often resulted in a breakdown of stable relations between quantities (the money multiplier and money demand functions) that are preconditions for monetary base targeting.<sup>6</sup> When steering interest rates, most central banks target the short end of the yield curve (in particular the overnight rate) because the influence is strongest and most direct. It also allows the central bank to use the information content of money market rates with longer maturities (interest rate expectations) for its monetary policy decisions.

A quantity variable, in contrast to a short-term interest rate, is typically chosen as the operating target when money markets are inefficient or not yet well-developed and quantities play a predominant role in the monetary transmission mechanism. Often both conditions apply in unison, since the lack of efficient money and securities markets contributes to monetary impulses being transmitted mainly through changes in quantities. Also in periods of high or hyper-inflation and subsequent periods of disinflation quantity effects are dominant. This explains why targeting quantity variables can to-date mainly be found in less advanced countries.<sup>7</sup> Moreover, many of these countries have capital restrictions and financial regulations in place that contribute to the stability of the money multiplier and money demand. The choice

---

<sup>6</sup> Nevertheless, even central banks that target a short-term interest rate continue to monitor and forecast the development of central bank balance sheet items, in particular banks reserves, since they indicate how much liquidity the central bank needs to withdraw or inject into the banking system.

<sup>7</sup> Prominent exceptions have been Switzerland and New Zealand. Until 1999 Switzerland targeted the monetary base, as operating and intermediate target, and New Zealand the level of excess reserves (settlement balances). In the United States, the Fed targeted unborrowed reserves during the brief period from 1979–1981.

between quantity and interest rate targeting becomes extremely difficult in transition periods when money demand and multiplier relations have become unstable, but at the same time no clear patterns have yet been observed between changes in short-term interest rates and inflation.

In principle, steering the monetary base can have advantages over steering one of its components. Some of the components are inherently volatile (in particular currency and excess reserves) while this volatility is automatically compensated by the monetary base as the aggregate (e.g., shifts from currency in circulation into banks' holdings of vault cash do not affect the monetary base). Moreover, changes in excess reserves are not always a good indicator for tightening or easing the monetary policy stance. High and volatile excess reserves can also reflect deficiencies in the payments and settlements systems and interbank money markets or be a sign of structural overliquidity of the banking sector resulting, for example from an inflationary policy in the past or unsterilized capital inflows (Kochhar 1996; Caprio and Honohan 1991). Net domestic assets (NDA) include items which are not under the immediate control of the central bank in the very short run. In particular the net position of the government can be volatile and difficult to forecast. This argument, however, also applies to the monetary base of which NDA is one item. Moreover, NDA is a variable that might be more difficult to understand and monitor by the public than the monetary base. On the other hand, an NDA target can be particularly useful to prevent the monetization of fiscal deficits, which is one reason why it has often been chosen as a performance criterion in IMF-supported programs (see for more details Chapter IV). An NIR operating target has the disadvantage that liquidity conditions would have to be steered through unsterilized foreign exchange interventions.

In times of market turbulences or banking crisis quantity targeting can have advantages over interest rate targeting. When a country faces sudden and large capital outflows, quantity targeting provides a buffer as it allows the interest rate to automatically adjust and thereby also helps stabilizing the exchange rate. In the case of interest rate targeting, the central bank would have to actively decide on how much to revise its interest target to achieve a similar effect. Similarly, if a single bank or a few banks experience liquidity problems, the central bank, as the lender-of-last resort, would provide the liquidity to these institutions, but would, at the same time, absorb any excess liquidity from the rest of the banking system to contain the quantity effect. In times of a systemic crisis, the overall liquidity in the banking system would need to be adjusted accordingly.

### **C. The Role of the Monetary Policy Strategy for the Choice of the Operating Target**

The central bank's monetary policy strategy also affects its choice of the operating target. To achieve its ultimate objectives a central bank uses intermediate targets or indicator variables (see graph on page 4). These serve as navigation systems in light of the complexity and the lags in the process of transmitting monetary policy signals. Four types of monetary policy strategies can be distinguished based on what type of intermediate targets or indicator variables are used: (i) exchange rate targeting, (ii) monetary targeting, (iii) a combination of exchange rate and monetary targets as is sometimes found in a transition phase to greater exchange rate flexibility, and (iv) direct targeting of the ultimate objectives by following indicator variables, in particular inflation targeting. At the same time, the choice of the



monetary policy strategy also reflects the view on the prevalent transmission channel of monetary impulses on the ultimate objective of monetary policy (through the exchange rate, monetary aggregates, or interest rates).

A price variable can be used as an operating target under any monetary policy strategy while targeting a quantity variable can be appropriate only for monetary targeting, and under certain circumstances, also under exchange rate targeting.<sup>8</sup>

Under **exchange rate targeting** and open capital account the interest rate is adjusted to maintain the exchange rate peg. Changes can also be the outcome of market forces when the central bank conducts unsterilized interventions. These are, however, limited by the amount of capital flows relative to a central bank's stock and access to foreign reserves.

Under **monetary targeting** the choice of the appropriate operating target is less clear. The monetary base is preferable when money markets are not well-developed and the central bank has no instruments for interest rate targeting at its disposal, and in cases of high or hyperinflation, where the link between the growth of a monetary aggregate and inflation is particularly close and quick. Since the source for money creation is typically the rapid growth in central bank credit to the government or the banking sector, bringing inflation under control requires decelerating base money growth. Short-term interest rates are the preferred operating target in a monetary targeting regime when the money multiplier fluctuates strongly and undermines the link between the monetary base and the monetary aggregate. It can also be preferable when the interest elasticity of the demand for monetary base is low.<sup>9</sup>

When countries **move from a fixed to a more flexible exchange rate regime**, it can sometimes be found that central banks simultaneously use exchange rate and monetary targets. When the focus of monetary policy is still on the exchange rate target, short-term interest rates are the most appropriate operating target; when the exchange rate band widens and the emphasis shifts towards the monetary aggregate, the central bank could, in principle, also consider targeting the monetary base. However, when monetary policy instruments that are suitable to steer a short-term interest rate and money markets developed are already in place, there are no clear merits from moving back to a quantity operating target.

In monetary policy **strategies using indicator variables** rather than intermediate targets, in particular inflation targeting, short-term interest rates are the preferred operating

---

<sup>8</sup> For an overview on alternative monetary policy frameworks see Mishkin (1999), for a discussion on exchange rate targeting see Mussa and others (2000), for inflation targeting see Bernanke and others (1999) and Schaechter and others (2000).

<sup>9</sup> In this case to achieve the desired monetary base effects will require sizable interest rate adjustments. Also, shifts in base money demand can result in large interest rate swings with possibly negative impacts on the financial sector.

target. Monetary variables tend to play a subordinate role since monetary relations are in many cases unstable—often a consequence of the evolution of the financial sector—which have motivated the use of this strategy.

#### **D. Operating Targets and Policy Instruments**

Steering the operating target calls for the use of specific monetary policy instruments that can be used for day-to-day liquidity management as well as to set and signal changes in the stance of monetary policy. Not all market-based instruments are equally suitable to steer a short-term interest rate or the monetary base.<sup>10</sup>

**Standing facilities** (refinancing and deposit facilities) that are available at the initiative of the counterparties, normally daily without any quantitative restrictions, other than collateral requirements, set an upper and lower boundary for short-term interest rates. Given these characteristics they are less suitable for monetary base targeting even though they ensure the functioning of the payment systems through providing end-of-day overdrafts.

**Open market operations** (outright or repurchase agreements in the secondary market) can be used either to target a short-term interest rate or the monetary base. The bidding procedure is crucial for what operating target they are most suitable. With an interest rate operating target, fixed rate tenders (volume tenders) are a suitable procedure. Price tenders can be used for both, monetary base and interest rate targeting. The central bank lets participants bid the price and determines the quantity it wants to sell or buy. If the central bank announces the amount it wants to allocate prior to the auction, it will have to tolerate the resultant price from the auction. Such a procedure is, therefore, useful in case of quantity targeting. If, on the other hand, the central bank refrains from declaring the desired auction volume, it can determine the allotment based on the bids that yield the quantity or the price it aims for. Such a procedure leaves sufficient flexibility for either price or quantity targeting.<sup>11</sup>

---

<sup>10</sup> Other determinants for the choice of policy instruments are the development of the financial sector and historical or political factors. For an overview on the design and merits of alternative monetary policy instruments see Baliño and Zamalloa (1997) and Alexander and others (1995). For country practices with operating procedures and policy instruments see Borio (1997) and Van't dack (1999).

<sup>11</sup> A downside of the more flexible procedure is that signaling is no longer unambiguous. Setting a minimum bidding price when the central bank auctions liquidity and a maximum price when it auctions deposits is a possibility to enhance the signaling role for interest rates, but it also has disadvantages. Some central banks have also announced a range of liquidity, instead of a specific amount, they are willing to allot in the auction. While this gives counterparts some indication on the quantity the central bank aims to inject or absorb, it also allows the central bank room to avoid too strong fluctuations of interest rates.

In **open market-type operations** the central bank sells government or central bank securities in the primary market. As for open market operations volume tenders are suitable for the interest rate targeting; price tenders are appropriate for both interest rate and monetary base targeting. The same holds true for the instruments of central bank **credit and deposit auctions**, including shifts in **public sector deposits**.

Unsterilized **outright operations on the foreign exchange market** by central banks can be used to target the exchange rate or the monetary base given sufficient central bank foreign reserves relative to the size of capital flows. **Foreign exchange swaps** affect the level of monetary base, but in contrast to outright operations, they have no direct effect on the exchange rate. Together with outright operations in foreign exchange they have often been used when foreign exchange markets were liquid, while money markets or government securities were still embryonic.

Changes in **reserve requirements** are neither an efficient instrument to steer a short-term interest rate nor the monetary base. Nevertheless, required reserves and averaging provisions can contribute to stabilizing fluctuations in short-term interest rates by performing a “buffer function.” In that respect they can also facilitate the functioning of the payment system. Required reserves can, to some extent, also help to stabilize the money multiplier.

### III. IMPACT ON THE CENTRAL BANK’S BALANCE SHEET

Both price and quantity targeting rely on the central bank’s ability to manage its balance sheet. The key difference is that, when central banks target a short-term interest rate, the adjustments in the balance sheet are mere reflections of the quantities needed to arrive at the envisaged rate. Quantities become endogenous. Conversely, when central banks target quantities, they exogenously determine and steer the quantity levels and accept the resulting interest rate, which becomes endogenous.

This chapter describes how the use of policy instruments affects the balance sheet of the central bank (see for a summary Box 1). While most instruments have very similar balance sheets effects, it is the nature of the operating target that makes them exogenous or endogenous. A typical balance sheet, which indicates how the different instruments are accounted for is presented as Table 1. This has been simplified in Table 2 by netting the external position of the central bank (net foreign assets) and the position against the government (net claims on government), as well as by summarizing all other assets and liabilities (other items net) to a presentation in which the sum of all components on the asset side and those on the liability side each equals the monetary base.

Box 1. Summary of Balance Sheet Movements under Different Monetary Policy Instruments

Monetary policy instrument	Operation	Central bank balance sheet movements			
		Monetary base	NDA	Bank reserves	NIR
1. Standing facilities	• Higher loans through refinancing facility	↑	↑	↑	Constant
	• Higher deposits through deposit facility	↓	↓	↓	Constant
2. Open market operations	• Outright purchase of securities or repos	↑	↑	↑	Constant
	• Outright sales of securities or reverse repos	↓	↓	↓	Constant
3. Open market-type operations	• Positive net issuance of central bank or govt. papers	↓	↓	↓	Constant
	• Negative net issuance of central bank or govt. papers	↑	↑	↑	Constant
4. Credit and deposit auctions	• Auctioning of credit	↑	↑	↑	Constant
	• Auctioning of deposits	↓	↓	↓	Constant
5. Foreign exchange operations	• Purchases of foreign currency	↑	Constant	↑	↑
	• Foreign exchange swap (purchase fx spot and sell forward)	↑	Constant	↑	↑
6. Shift of public sector deposits	• Into the banking system	↑	↑	↑	Constant
	• From the banking system to the central bank	↓	↓	↓	Constant
7. Reserve requirements	• Increase in reserve ratios:				
	- Short-run	↑	↑	↑	Constant
	- Medium-run	?	?	?	Constant
	• Reduction in reserve ratios:				
	- Short-run	↓	↓	↓	Constant
	- Medium-run	?	?	?	Constant

Table 1. Central Bank Balance Sheet

Assets	Liabilities
1. Claims on nonresidents	6. Liabilities to nonresidents
1.1. Monetary gold and SDR holdings	6.1. Deposits from nonresidents in foreign currency
1.2. Foreign currency	6.2. Securities other than shares in foreign currency
1.3. Deposits with nonresidents in foreign currency	6.3. Loans from nonresidents in foreign currency
1.4. Securities other than shares in foreign currency	6.4. Use of IMF facilities
1.5. Loans to nonresidents in foreign currency	6.5. Other foreign debt
1.6. Holdings of SDRs	
1.7. Other foreign assets	
	7. Currency in circulation
2. Claims on the government	8. Securities issued by the central bank
2.1. Securities	9. Government deposits
2.2. Loans and advances	
2.3. Other	
3. Claims on deposit money banks	10. Liabilities to deposit money banks
3.1. Loans through Lombard and overdrafts facilities	10.1. Current accounts (required reserves and excess reserves)
3.2. Rediscount and secured advances	10.2. Vault cash
3.3. Other loans (including repos)	10.3. Deposit facility/auctioned deposits
3.4. Other	
4. Claims on other sectors	11. Deposits by others sectors
4.1. Private sector	11.1. Private sector
4.2. Nonfinancial public enterprises	11.2. Nonfinancial public enterprises
4.3. Nonmonetary financial institutions	11.3. Nonmonetary financial institutions
4.4. Other	11.4. Other
5. Other assets	12. Revaluation accounts
	13. Capital accounts
	13.1. Capital
	13.2. Reserves
	14. Other liabilities

Table 2. Summary Balance Sheet of a Central Bank 1/

Assets	Liabilities
Net foreign assets (NFA=1.-6.)	Currency in circulation (C=7.)
Net position of the government (NPG=2.-9.)	Bank reserves (R=10.1.+10.2.)
Claims on deposit money banks (L=3.)	
Other items net (OIN=4.+5.-8.-10.3.-11.-12.-13.-14.)	
= Monetary base (B)	= Monetary base (B)

1/ Numbers in brackets refer to Table 1.

## **Standing facilities**

Providing central bank credit through refinancing facilities injects liquidity into the banking system, while accepting deposits withdraws liquidity. In the first case, NDA, bank reserves, and the monetary base expand, in the latter they contract. The impact on the central bank's balance sheet is as follows.

Borrowing from the central bank through a refinancing facility (Lombard, rediscount, or overdraft) raises the central bank's claims on deposit money banks (item 3.1 in Table 1 and item L in Table 2) and, at the same time, increases the value of banks' current accounts with the central bank (item 10.1). Should banks receive portions of the central bank credit in cash, then banks' vault cash holdings would also rise (item 10.2). Conversely, repaying outstanding loans reduces banks' reserves as well as the central bank's claim on them. As a result, the monetary base shrinks.

Operations through the deposit facility of a central bank change the composition of the central bank's liabilities to banks. Balances shift between banks' current accounts (item 10.1 in Table 1) and the deposit facility (item 10.3). Since the latter is typically not considered as part of "bank reserves", there will be an overall impact on the level of bank reserves and monetary base, which is exactly reverse to that of operations through refinancing facilities. NDA, however, remain unchanged.

## **Open market operations**

The overall impact of open market operations is identical to that of refinancing standing facilities. Open market purchases (outright or repo) raise bank reserves, NDA, and the monetary base; open market sales (outright or reverse repo) have the opposite effect. How exactly these operations are accounted for on the asset side of the central bank balance sheet depends on the accounting principles applied. In outright operations the securities purchased or sold are typically accounted for under claims against the government, deposit money banks, or other sectors (items 2., 3., and 4.), depending on the paper that underlies the transaction. Repurchase transactions can be accounted for in the same way as outright operations but with separate subaccounts or codings to clearly identify the relevant securities that are subject to repurchase operations. A preferable and the most common practice among central banks is to treat repos as secured advances rather than as security holdings and show them separately in the balance sheet as repurchase agreements (item 3.3 in Table 1).

## **Open market-type operations**

The difference between open market-type and open-market operations is that the former take place on primary market, while the latter are carried out on the secondary market. Open market-type operations can be conducted with government or central bank securities. Positive net issuance of papers (i.e., higher values of new issuance than maturing papers) withdraws liquidity, while negative issuance injects liquidity. In the case of selling central bank papers, the central bank's liabilities (item 8.) increase, while in the case of selling government papers,

government's deposits with the central bank rise (item 9.). Both types of operations lead to reductions in the level of banks' current accounts (10.1). NDA and the monetary base fall.

### **Credit and deposit auctions**

The impact of credit and deposit auctions on the central bank balance sheet is the same as that of transactions through refinancing and deposit facilities.

### **Foreign exchange operations**<sup>12</sup>

Central bank **outright operations** on the foreign exchange market with the banking system affect the asset and liability side of the central bank balance sheet, changing the level of bank reserves and the monetary base. Purchasing (selling) foreign exchange has an expansionary (contractionary) effect by increasing (reducing) the central bank's claims on nonresidents and banks' reserves. The monetary base rises (falls), but NDA remain unchanged. Typically—when permitted by the central bank legislation—banks hold most foreign reserves in securities (item 1.4. in Table 1).

The balance sheet effects of central bank **foreign exchange swaps** with the banking system are, in principle, the same as those of outright operations. The spot leg of the transactions is accounted for as explained above. For example, in an expansionary exchange swap the central bank acquires foreign exchange spot which raises claims on nonresidents (item 1.) and banks' current accounts (item 10.1). The forward leg creates, in this case, a forward foreign liability that is matched by a forward domestic asset. These contingent claims and obligations are, in most cases, recorded initially in off-balance sheet accounts and, subsequently, in on-balance sheet accounts for each receipt or payment. Recently, central banks have also engaged in other derivative foreign exchange operations. Since these financial instruments create assets and liabilities that are contingent, they are, by definition, treated as off-balance sheet items. Central bank operations in derivatives have therefore no impact on their balance sheets other than realized gains or losses.<sup>13</sup>

---

<sup>12</sup> Exchange rate variations itself should not have any impact on the central bank's balance sheet and the liquidity situation of the banking system. While they are booked in the revaluation account, they have a counter position in the central bank's capital. In some countries, revaluation gains are transferred monthly to the government and if used for transactions will effect liquidity.

<sup>13</sup> See Blejer and Schumacher (2000) for a discussion of the rationale for a central bank to engage in operations involving contingent liabilities. The authors also argue for a portfolio approach that would aggregate all on and off-balance sheet transactions to obtain "economic" rather than "accounting" values of all items.

Engaging in outright and foreign exchange operations with another central bank leaves net foreign assets, bank reserves, and the monetary base unchanged. These transactions change claims on and liabilities to nonresidents (items 1. and 6. in Table 1) by the same amount. Only when a central bank uses foreign loans from another central bank to expand claims on the government, deposit money banks, or other sectors (items 2., 3. or 4.) will bank reserves and base money also rise.

An alternative way to account for foreign exchange swap operations is to treat them as collateralized loans. Under this approach, the papers or instruments which are used for the swap remain to be registered on the banks' balance sheets. Then, claims on deposit money banks rather than claims on nonresidents are affected (Hooyman 1997).

### **Public sector deposits**

Shifting public sector deposits between the government accounts with the central bank and the government accounts with banks merely changes the structure of central bank liabilities. To inject liquidity, government deposits (item 8.) would have to be transferred from the central bank to banks. This operation increases banks reserves (item 10.1) and thereby the monetary base.

### **Reserve requirements**

As mentioned earlier (Section II.D), adjusting reserve ratios is not generally viewed as an efficient means to actively manage liquidity, while reserve averaging can function as a buffer helping to stabilize the short-term interest rate. Raising reserve ratios normally tightens liquidity conditions, except for countries in which banks hold large amount of excess reserves. Higher interest rates would be the result, while the effect on the monetary base is ambiguous. In the short-run, the monetary base might expand despite higher reserve ratios, since it can be difficult for banks to adjust their balance sheets and reserve base (mostly customer deposits). To be able to fulfill the higher reserve requirements, central banks would then have to provide the banking system with the needed liquidity, which increases the monetary base in the short run. Over the medium term, the impact on the monetary base depends on how much the reserve base is being reduced relative to the increase in the reserve ratio.

## **IV. THE ROLE OF MONETARY CONDITIONALITY FOR MONETARY POLICY**

The purpose of this chapter is to discuss how the implementation of monetary policy affects the central bank balance sheet item net domestic assets (NDA). Ceilings on NDA and floors on the central bank's net international reserves (NIR) are typically set as quantitative performance criteria in IMF-supported programs. While the purpose of NIR floors under fixed exchange rate regimes is to signal whether a program is likely to achieve its external objectives



and, therefore, the ability to repay Fund resources,<sup>14</sup> the main role of ceilings on NDA is to establish safeguards for the use of Fund resources by preventing excessive central bank credit expansion or sterilization of foreign exchange interventions.<sup>15 16</sup> NDA is defined as the sum of the central bank's net position to the government, claims on deposits money banks, and other items net (see Table 2) or, put differently, the difference between the monetary base and NIR. The idea is to construct a variable that comprises all domestic elements of the central bank balance sheet, including those that are under the control of the central bank.<sup>17</sup>

Deriving ceilings for NDA is part of the financial programming exercises implemented in Fund-supported programs. The theoretical foundation is the Polak model.<sup>18</sup> It is based on the monetary approach to the balance of payments, which views balance of payments fluctuations as a monetary phenomenon. In its simplest version, the Polak model centers around four identities—the monetary survey, the central bank balance sheet, the money multiplier, and the balance of payments constraint—and one behavioral equation—the demand for money (see Appendix II). A path for changes in NIR, which is equivalent to the balance of payments target, is projected consistently with the objectives and projections for real GDP growth, inflation, and the fiscal deficit. At the same time, using an assumption for velocity, the demand for money is estimated. Both projections, together with an assumption about the money multiplier, are then used to determine the maximum change in NDA of the central bank.

NDA ceilings can function as an operating target or a performance criterion. As described in Section II.B, the use of NDA ceilings as an operating target can be considered

---

<sup>14</sup> Under floating exchange rates, external objectives are usually viewed in broader terms such as medium-term current account sustainability.

<sup>15</sup> For an overview on the motivation, design, and experience with Fund conditionality see Schadler and others (1995) and Mussa and Savastano (1999).

<sup>16</sup> As of end-June 2001 an NDA ceiling for the central bank has been applied for more than 80 percent of the countries supported by an IMF program. This excludes countries with currency board arrangements or no separate legal tender for which this type of monetary conditionality is not applied. Moreover, in three cases the NDA ceiling related to the entire banking system. The monetary base has only been used in four cases as a performance criterion, sometimes in addition, sometimes in place of an NDA ceiling. NIR floors for the central bank, on the other hand, have been applied in all cases.

<sup>17</sup> Strictly speaking, NDA is not a pure “net” variable. Claims against banks are mostly gross, since bank reserves are excluded from NDA. Banks' deposits with the central bank are only part of NDA insofar as they result from a deposit facility or auctioned deposits.

<sup>18</sup> For the model that underlies the Fund's financial programming exercise and its extensions see, for example, Polak (1957, 1997), IMF (1987) and Fischer (1997).

under a monetary targeting framework and must be based on a stable money multiplier and money demand. On the other hand, using NDA ceilings as a performance criterion, does not require a central bank to steer NDA as part of its daily liquidity management exercise, but leaves room also for the use of other operating targets (monetary base or short-term interest rate). In contrast to an operating target, the intervals at which performance criteria are set are much larger (typically end-of-quarter or end-of-month compared to daily or weekly, sometimes monthly for operating targets). Despite NDA ceilings being derived and based on a view that the relationships between monetary quantity variables are stable and quantity variables are steered for conduct monetary policy, an NDA performance criterion has some built-in flexibility. First, the IMF can grant a waiver for non-observing the NDA ceiling, if the underlying developments are different than expected. For example, the overshooting of the NDA ceiling is caused by an unexpected increase in money demand rather than an excessive easing of monetary policy. For this to work does not require that the central bank target NDA, but only that movements in NDA provide enough information on the monetary policy stance to be useful in triggering a reassessment of policy, which can at times be very difficult. Second, when NDA ceilings for future months/quarters have previously been set only as indicative targets, they can be adjusted in the context of a program review. The former is an ex post flexibility, the latter an ex ante flexibility built into the IMF-supported program conditionality.

NDA ceilings can be particularly useful to prevent the monetization of fiscal deficits. In countries in which the central bank has been prone to influence by the government with the objective of funding fiscal deficits, setting NDA ceilings as part of an IMF-supported program can help to avoid an overly loose stance of monetary policy. In such circumstances, the dominant transmission channel for monetary impulses are changes in quantities of monetary aggregates. NDA or the monetary base can then function as effective operating targets and performance criteria.

Using NDA developments as a signal extraction to view whether monetary policy is still on track becomes increasingly difficult in environments of structural changes, including increasing degree of financial liberalization and elimination of capital restrictions, that can all have an impact on the money multiplier and money demand stability. Such developments have led a number of countries to operate under flexible or managed floats and follow leading indicator variables in attaining their ultimate objectives. Inflation targeting is a formalized approach of such a strategy that is gaining popularity

For central banks that steer short-term interest rates and for which items of the central bank balance sheet are endogenous, the use of NDA ceilings as a performance criterion can therefore become problematic (see also Box 1).<sup>19</sup> Because of the instability of the relations

---

<sup>19</sup> See also Blejer and others 2001 who argue that NDA ceilings are problematic for inflation targeting countries. The central bank's operating target predominantly determines the appropriateness of NDA ceilings as a performance criterion. What type of operating target a central bank chooses to steer is closely related to the monetary policy strategy as described in Section II.C.

between quantity variables overshooting the NDA ceiling is not necessarily an indicator that the policy stance is too expansionary. In strategies that operate without intermediate targets, such as inflation targeting, indicator variables might signal the need to ease monetary policy, while NDA is above the ceiling. A similar conflict can also arise in the cases of monetary and exchange rate targeting. A fall in the money multiplier or a reduction in central bank rates to slow down capital inflows and halt real appreciation of the currency could both result in pushing NDA above its ceiling without endangering price stability. Adhering to NDA ceilings, under these circumstances, would be counterproductive. It could not only lead to an inappropriate tightening of monetary policy, but also introduce interest rate volatility and uncertainty should a central bank adjust the level of NDA shortly before the review dates for the performance criteria. One way to circumvent these difficulties, which is a procedure provided for in IMF-supported programs, is to revise the performance criteria accordingly when new information becomes available and the underlying assumptions change. However, frequently revising NDA ceilings or allowing for a large margin could render them in fact non-binding.<sup>20</sup>

Consequently, for inflation targeting countries the Fund has adopted a new approach for monetary conditionality which no longer focuses merely on central bank balance sheet items. Under this “reviews-based” approach, NIR floors are retained to limit the use of the IMF resources for foreign exchange market intervention, but NDA ceilings are replaced by quarterly reviews of the stance of monetary policy. These reviews would be used to assess, based on various indicators, including recent inflation outturns and various leading indicators of inflation, whether monetary policy is on track to achieve its medium-term inflation target. Consistent with these targets, the IMF-supported program would specify a quarterly inflation path, with which current and projected inflation would be compared. It would also be agreed, that whenever the outlook suggests that future inflation objectives are likely to be missed by a pre-specified margin, that this triggers remedial action by the central bank, in most cases an increase in interest rates.

A variant of this approach is currently in use for Brazil, an inflation targeting country supported by an IMF arrangement (Blejer and others, 2001 and Brazil–Technical Memorandum of Understanding 2000). The Central Bank of Brazil has regular contacts with the IMF staff on the conduct of monetary policy and inflation prospects and the new approach to monetary conditionality has so far proven to be successful. Based on the government’s announced annual inflation targets, quarterly bands of  $\pm 1$  percentage points for the inner band and  $\pm 2$  percentage points for the outer band have been established. Should the inflation rate exceed the upper limit of the inner band, the central bank will discuss the appropriate policy response with the IMF (“consultation mechanism for inflation”). In case of a breach of the upper limit of the outer band, the authorities will complete consultations with the IMF’s Executive Board on the

---

<sup>20</sup> NIR floors, however, can retain their function as performance even when central banks target short-term interest rates. NIR floors ensure that central banks do not draw down their foreign reserves to an extent that jeopardizes the external viability.

proposed policy response. Indicative NDA ceilings were retained over the first 18 months of the program.

## V. CONCLUSIONS

The choice of the operating target determines whether impacts on the central bank's balance are exogenous or endogenous. When the central bank targets a short term interest rate, effects on the balance sheet are the residual outcome of these operations. Conversely, when a central bank targets quantities, it tolerates fluctuations in short-term interest rates.

Whether a central bank chooses to steer a short-term interest rate or a quantity variable depends foremost on the development of financial markets and the monetary policy strategy under which it operates. Interest rate targeting is only an option when money and government securities markets are fairly well-developed and efficient and interest rates are indicators of market conditions. In countries in which these prerequisites are not yet given or do not exist because of the size of the market, quantity variables can provide useful information and be used as operating targets. This explains why monetary base targeting can to-date mostly be found in developing countries, while central banks of industrial and emerging market countries tend to prefer targeting a short-term interest rate. While a short-term interest rate is a suitable operating target under all monetary policy strategies, targeting quantities can be an option for monetary and exchange rate targeting regimes. When inflation is high and the transmission mechanism is dominated by quantity effects, the monetary base is the preferred operating target for a monetary targeting central bank. When inflation is low, monetary base targeting is only advisable when the money multiplier is stable and the demand for monetary base considerably elastic. With an exchange rate peg, targeting the monetary base is an alternative when international capital movements are still restricted. In practice, countries tend to move to targeting a short-term interest rate when the financial system develops and capital restrictions are eliminated.

The choice of the operating target also determines what type of policy instruments are appropriate to implement monetary policy. Standing facilities are suitable for interest rate targeting since the central bank sets the refinancing and deposit rates for these facilities but the credit or deposits quantities are at the initiative of banks. Open market operations, open market-type operations, credit and deposit auctions, and transfers of public sector deposits can, in principle, be used both for a price and a quantity operating target. The bidding procedure employed by the central bank is crucial. Foreign exchange operations, outright or swap, can be a means to steer the monetary base, when money markets are not yet well-developed. Since their impact on interest rates is indirect, they are less suited for interest rate targeting. Reserve requirements are not an efficient means for active liquidity management. However, required reserves can contribute to stabilizing money market rates when banks have to fulfill the reserve requirements only on average over the reserve period.

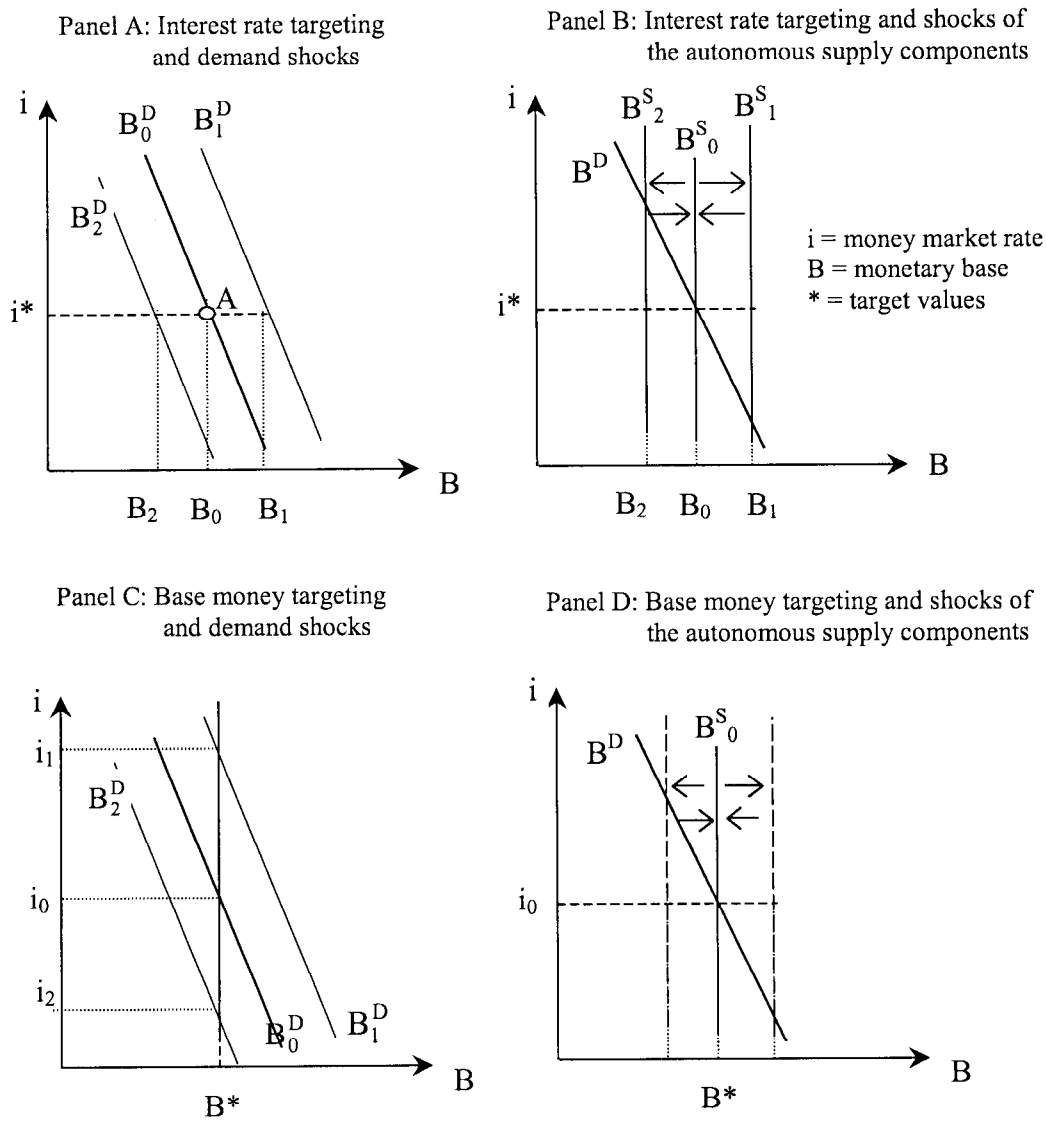
The traditional monetary performance criteria in IMF-supported programs—NDA ceilings and NIR floors—do not require them to be used as operating targets, but NDA ceilings

can be problematic for interest rate targeting central banks. Traditional monetary conditionality has some build-in flexibility since performance criteria are set at larger intervals (typically quarterly) than operating targets and can be revised flexibly when new information becomes available upon review of the program. Nevertheless, these performance criteria are based on the view that central banks conduct monetary policy by steering quantities and the assumptions of a stable money multiplier and stable and predictable money demand. This is often not realized for central banks that follow a multi-indicator approach (including inflation targeting). NDA ceilings can be counterproductive when applied too strictly or non-binding when applied too flexibly. Consequently, a new conditionality approach has been developed for inflation targeting central banks which no longer focuses on quantities in the central bank balance sheet.

### Steering Operating Targets Under Uncertainty

As the monopolistic supplier of base money a central bank can set its price or quantity. In other words, it can pick any point on the banking systems' demand curve for base money (see Figure 1). With stable market conditions at all times targeting the price or the quantity would just be two sides of the same coin. In Figure A.1 point A could be achieved by either setting  $i_0$  or  $B_0$ .

Figure 1: Alternative Operating Targets



Uncertainties and instability in the demand or the supply of base money lead to fluctuations in money market rates if the central bank targets quantities and fluctuations in quantities if it targets an interest rate (see Figure 1). Under both operating procedures central banks have to conduct liquidity forecasts to be in a position to offset undesired fluctuations of the interest rate or a quantity variable. In the case of interest rate targeting, the central bank would accommodate any shifts in the demand or autonomous supply of base money to avoid the interest rate moving away from its target level (Figure 1.A and 1.B). In the case of base money targeting, shifts in the demand for base money would not be accommodated and could cause interest rate volatility (Figure 1.C). These are particularly large when the interest rate elasticity of the demand for base money is low (i.e., the demand curve is steep). Shifts in the autonomous supply components (in particular the net position of the government) would have no effect on the money market rate or the level of base money, since they could be entirely compensated by adjustments in central bank balance sheet components that are under the central banks' control (Figure 1.D).

### Deriving NDA Ceilings in Fund-Supported Programs

NDA ceilings are derived as part of the financial programming exercises in Fund-supported programs. The theoretical foundation is provided by the Polak model.<sup>21</sup> It is based on the monetary approach to the balance of payments, which views balance of payments fluctuations as a monetary phenomenon. In its simplest version, the Polak model centers around 4 identities—the monetary survey, the central bank balance sheet, the money multiplier, and the balance of payments constraint—and 1 behavioral equation—the demand for money.

The first step of a financial programming exercise is to set objectives for the balance of payments, real GDP growth, inflation, and the fiscal deficit. The balance of payments target is expressed as a change in net international reserves ( $\Delta\text{NIR}^*$ ). This results from the fact that the change in net international reserves equals the sum of the current account (CA) and the change in net foreign indebtedness ( $\Delta\text{FI}$ ) (equation 1).

$$(1) \quad \Delta\text{NIR}^* = \text{CA} + \Delta\text{FI}.$$

The second step is to project the change in money demand ( $\Delta\text{M}^D$ ). A very simple way would be to use the estimated velocity of money ( $v$ ) and use the target value for nominal GDP ( $\Delta\text{Y}^*$ ) which can be derived from the real GDP growth target and the inflation target (equation 2).

$$(2) \quad \Delta\text{M}^D = \frac{1}{v} \Delta\text{Y}^*.$$

In a third step, the level of net domestic assets of the banking system ( $\Delta\text{NDA}^{\text{BS}}$ ) needed to adjust to satisfy the projected money demand change given the NIR target is calculated. For this, the money stock identity from the monetary survey is used (equation 3, in which  $\Delta\text{M}^*$  stands for the change in money stock). In addition, it is assumed that changes in net foreign assets of the banking system ( $\Delta\text{NFA}$ ) are identical to changes in net international reserves of the central bank ( $\Delta\text{NIR}$ ).

$$(3) \quad \Delta\text{M}^* = \Delta\text{M}^D = \underbrace{\Delta\text{NFA}}_{=\Delta\text{NIR}^*} + \Delta\text{NDA}^{\text{BS}} \quad \text{or} \quad \Delta\text{NDA}^{\text{BS}} = \Delta\text{M}^* - \Delta\text{NIR}^*.$$

The fourth and final step is to calculate the ceiling for the change in net domestic assets of the central bank ( $\Delta\text{NDA}^*$ ) that corresponds with the change in net domestic assets of the banking system ( $\Delta\text{NDA}^{\text{BS}}$ ). For this calculation, the central bank balance sheet identity,

---

<sup>21</sup> See Polak (1957, 1997), IMF (1987) and Fischer (1997).



which defines the change in base money ( $\Delta B$ ) as the sum of  $\Delta NIR^*$  and  $\Delta NDA$ , and the money multiplier relation ( $m$ ) are used (equations 4 and 5).

$$(4) \quad \Delta B = \Delta NIR^* + \Delta NDA .$$

$$(5) \quad \Delta B = \frac{1}{m} \Delta M^* .$$

Setting equations (4) and (5) equal, yields the following maximum amount by which the central bank may change its NDA position to comply with the financial programming exercise:

$$(6) \quad \Delta NDA^* = \frac{1}{m} \Delta M^* - \Delta NIR^* .$$

Table 1. Interest Rate versus Base Money as Operating Targets

	Advantages	Disadvantages
Short-term interest rate	<ul style="list-style-type: none"> <li>• Reduces fluctuations in interest rates</li> <li>• Facilitates banks' liquidity management</li> <li>• Allows for clear signaling</li> <li>• Easy to monitor and understand</li> <li>• Appropriate when transmission is mostly through interest rates</li> </ul>	<ul style="list-style-type: none"> <li>• Requires developed money markets</li> </ul>
Monetary base	<ul style="list-style-type: none"> <li>• Does not require developed and efficient money markets</li> <li>• Appropriate when transmission is mostly through quantities</li> </ul>	<ul style="list-style-type: none"> <li>• Timeliness and frequency of quantity variables might be lower than for interest rates</li> <li>• Can be more difficult to monitor and understand</li> <li>• Signaling is more problematic</li> <li>• Creates interest rate fluctuations that might impede banks' liquidity management</li> </ul>

Table 2. Preferred Operating Target Under Alternative Monetary Policy Frameworks

Monetary policy framework	Operating target
Exchange rate targeting	
Developed money markets or open capital accounts	Short-term interest rate
Undeveloped money markets or strong capital restrictions	Monetary base (or NIR)
Monetary targeting	
High inflation or undeveloped money markets	Monetary base
Low inflation; stable money multiplier	Monetary base (or bank reserves)
Low inflation; developed money markets; or unstable money multiplier	Short-term interest rate
Exchange rate and monetary targeting	Short-term interest rate
Multi-indicator approach (including inflation targeting)	Short-term interest rate

Table 3. Preferred Policy Instruments Under Alternative Operating Targets 1/

Monetary Policy Instruments	Price targeting	Quantity targeting
Standing facilities	Suitable.	Not suitable (except overdraft).
Open market operations Open market-type operations Credit and deposit auctions Public sector deposits	Fixed rate tenders most suitable; but also variable rate tenders, particularly with minimum bid price (refinancing) or maximum bid prices (deposits).	Variable rate tenders most suitable.
Foreign exchange outright operations	Suitable for exchange rate targeting; for interest rate targeting only suitable to smooth temporary sharp interest rate fluctuations.	Suitable, when the spot foreign exchange market is developed but not the money market.
Foreign exchange swaps	Only suitable to smooth temporary sharp interest rate fluctuations.	Suitable, when the foreign exchange market is developed but not the money market.
Reserve requirements	Reserve averaging provides a buffer function.	Required reserves can, to some extent, contribute to stabilizing the money multiplier.

1/ For a similar categorization see Bofinger (forthcoming).

## References

- Alexander, William E., Tomás J.T. Baliño, Charles Enoch, Francesco Caramazza, George Iden, David Marston, Johannes Mueller, Ceyla Pazarbasioglu, Marc Quintyn, Matthew Saal, and Gabriel Sensenbrenner, 1995, *The Adoption of Indirect Instruments of Monetary Policy*, IMF Occasional Paper 126 (Washington: International Monetary Fund).
- Baliño, Tomás J.T. and Lorena M. Zamalloa, 1997, eds., *Instruments of Monetary Management. Issues and Country Experiences*, (Washington: International Monetary Fund).
- Bernanke, Ben S., Thomas Laubach, Frederic Mishkin, and Adam S. Posen, 1999, *Inflation Targeting. Lessons from the International Experience* (Princeton University Press)
- Blejer, Mario I., Alfredo M. Leone, Pau Rabanal, and Gerd Schwartz, 2001, "Inflation Targeting in the Context of IMF-Supported Adjustment Programs," IMF Working paper 01/31 (Washington: International Monetary Fund).
- Blejer, Mario I. and Liliana Schumacher, 2000, "Central Banks Use of Derivatives and Other Contingent Liabilities: Analytical Issues and Policy Implications", IMF Working Paper 00/66 (Washington: International Monetary Fund).
- Bofinger, Peter, forthcoming, *Monetary Economics*, Oxford University Press.
- Borio, Claudio E.V., 1997, "The Implementation of Monetary Policy in Industrial Countries: A Survey," Bank for International Settlements Economic Papers No. 47 (Basel).
- Caprio Gerard Jr. and Patrick Honohan, 1991, "Excess Liquidity and Monetary Overhangs", World Bank Working Paper (Financial Policy and Systems) No 796 (Washington).
- Fischer, Stanley, 1997, "Applied Economics in Action: IMF Programs", in: *American Economic Association Papers and Proceedings*, Vol. 87, No. 2, pp. 23–27.
- Friedman, Benjamin, 1975, "Targets, Instruments, and Indicators", in: *Journal of Monetary Economics*, Vol. I, No. 4, pp. 443–473.
- Hooyman, Catharina J., 1997, "Use of Foreign Exchange Swaps by Central Banks", in: Baliño, Tomás J.T. and Lorena M. Zamalloa, 1997, eds., *Instruments of Monetary Management. Issues and Country Experiences*, (Washington: International Monetary Fund), pp. 148172.
- International Monetary Fund, 1987, *Theoretical Aspects of the Design of Fund-Supported Adjustment Program*, Occasional Paper No. 55 (Washington).
- International Monetary Fund, *Brazil–Memorandum of Economic Policies and Technical Memorandum of Understanding*, November 12, 1999 and April 20, 2000 (Washington).

- Kochhar, Kalpana, 1996, "The Definition of Reserve Money: Does It Matter for Financial Programs?", IMF Paper on Policy Analysis and Assessment PPAA/96/9 (Washington: International Monetary Fund).
- Mishkin, Frederic S., 1999, "International Experiences with Different Monetary Policy Regimes," in: *Journal of Monetary Economics*, Vol. 43, No. 3 (June), pp. 579–605.
- Mussa, Michael, Paul Masson, Alexander Swoboda, Esetban Jadresic, Paulo Mauro, and Andrew Berg, 2000, *Exchange Rate Regimes in an Increasingly Integrated World Economy*, IMF Occasional Paper 193 (Washington: International Monetary Fund).
- Mussa, Michael, and Miguel Savastano, 1999, "The IMF Approach to Economic Stabilization," IMF Working Paper WP/99/104 (Washington: International Monetary Fund).
- Polak, Jacques J., 1957, "Monetary Analysis of Income Formation and Payments Problems", reprinted 1977 in: International Monetary Fund, *The Monetary Approach to the Balance of Payments*, pp. 15-64 (Washington).
- Polak, Jacques J., 1997, "The IMF Monetary Model at Forty", IMF Working Paper WP/97/49 (Washington: International Monetary Fund).
- Schadler, Susan; Bennett, Adam; Carkovic, Maria; Dicks-Mireaux, Louis; Mecagni, Mauro; Morsink, James H J; Savastano, Miguel A, 1995, *IMF Conditionality: Experiences Under Stand-by and Extended Arrangements, Part I: Key Issues and Findings*, IMF Occasional Paper No. 128, (Washington: International Monetary Fund).
- Schaechter, Andrea, Mark R. Stone, and Mark Zelmer, 2000, *Adopting Inflation Targeting: Practical Issues for Emerging Market Countries*, IMF Occasional Paper 202 (Washington: International Monetary Fund).
- Van't dack, Jozef, 1999, "Implementing Monetary Policy in Emerging Market Economies: An Overview of Issues," in: Bank for International Settlements Policy Papers No. 5, (Basel), pp. 3–72.